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(54) A new wheelbarrow design

(57) A new wheel barrow design with a rotating de-mountable bucket 4, releasably secured and pivoted at its balance point 5 to a tubular frame 6 which embodies, wheels 24, brakes 21 for the aforementioned and a locking mechanism 9 to stop the bucket rotating when lifting and moving loads. There is a pulley system to facilitate the rotation of the bucket when emptying loose loads such as sand or stones. The bar 23 allows the user to impart a levered force using his body weight and gravity alone on the load, the fulcrum being at the axles 14. Once righted the bucket is balanced on the pivot points 5 over the axle 14 and therefore the user only has to apply pushing forces to the barrow to propel it forward and not use energy in lifting the load whilst moving it.

Figure 7

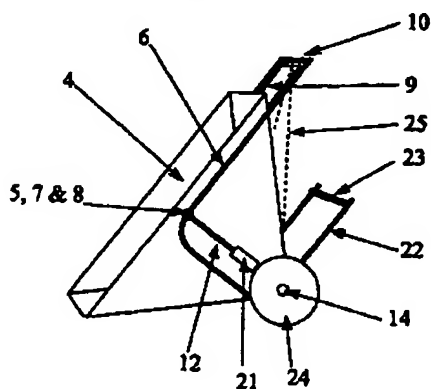
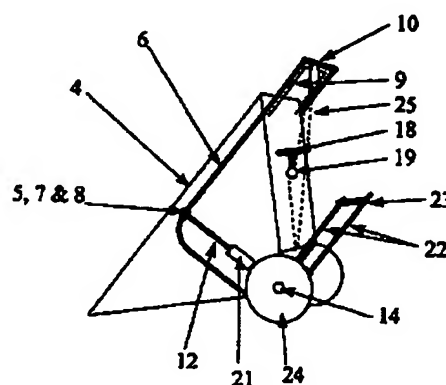


Figure 8



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Figure 1

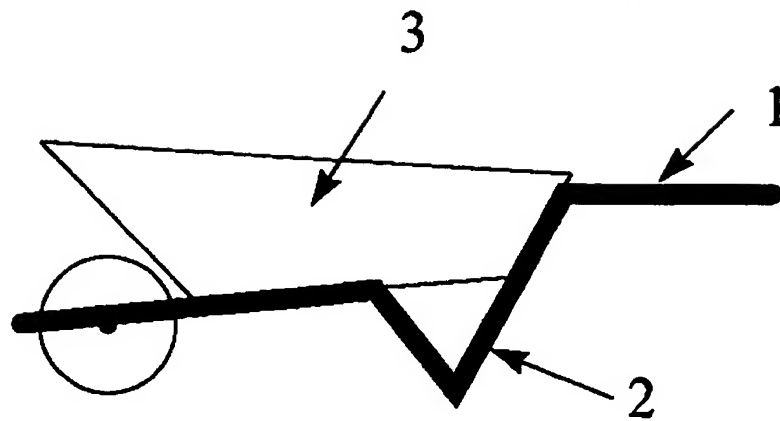
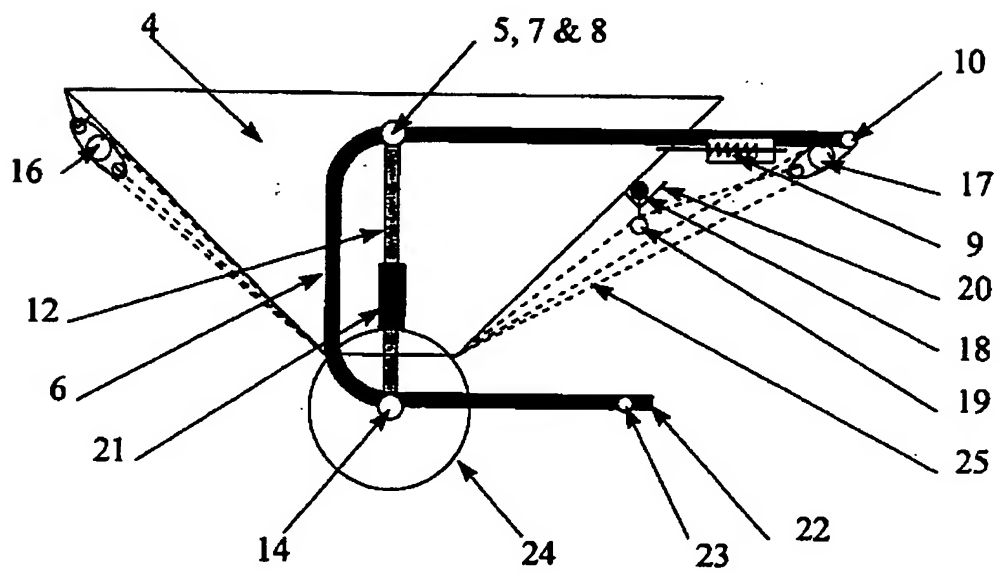


Figure 2



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Figure 3

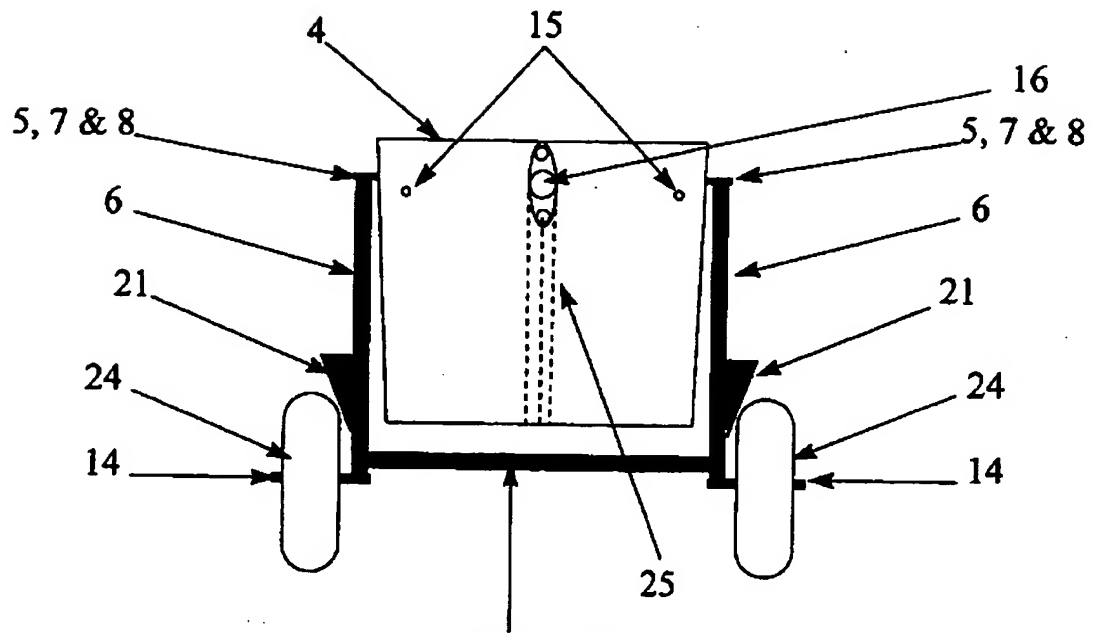
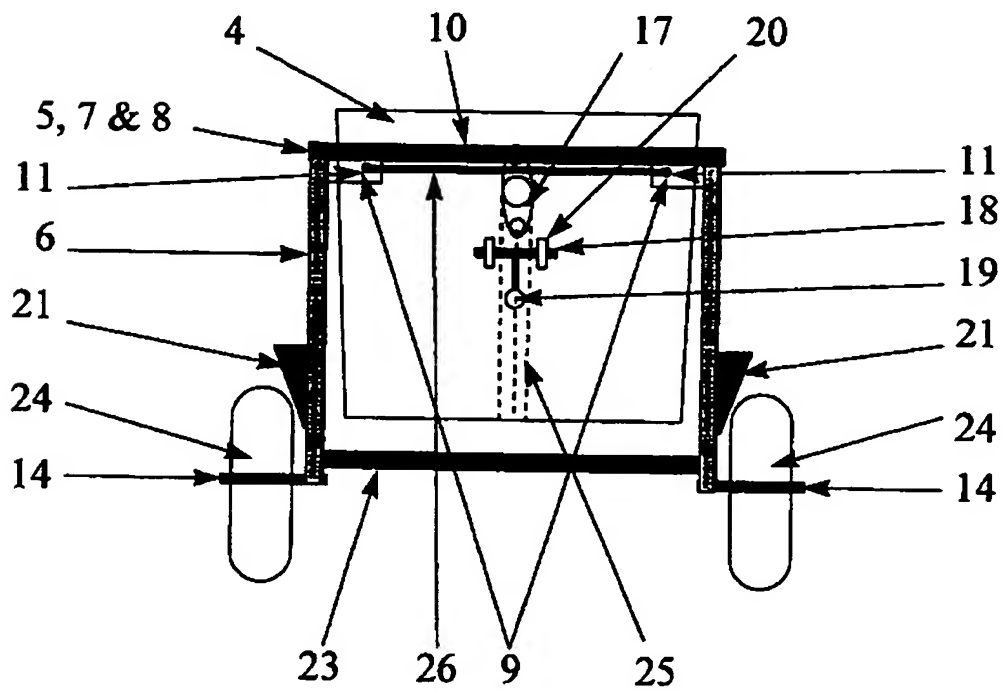


Figure 4



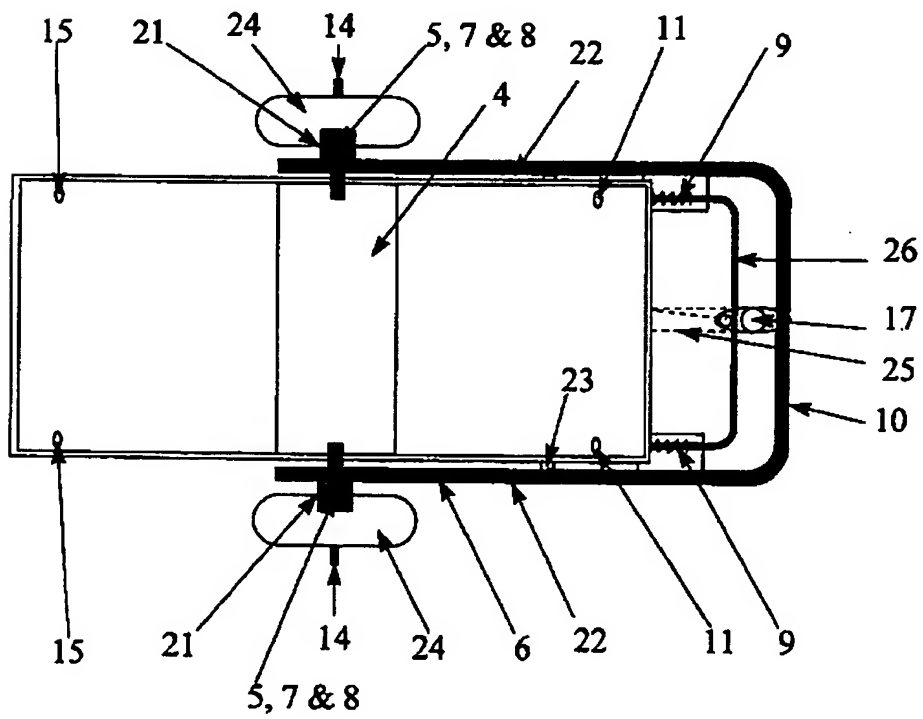


Figure 7

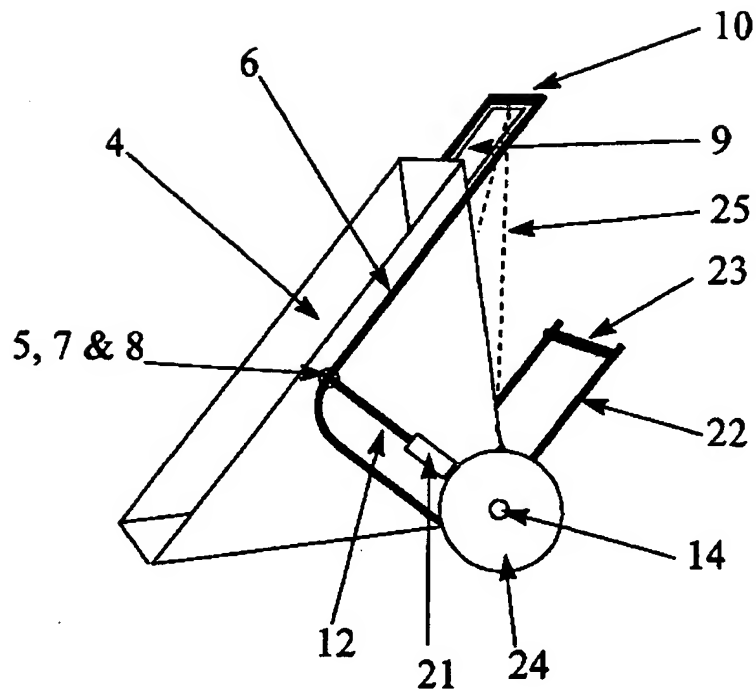
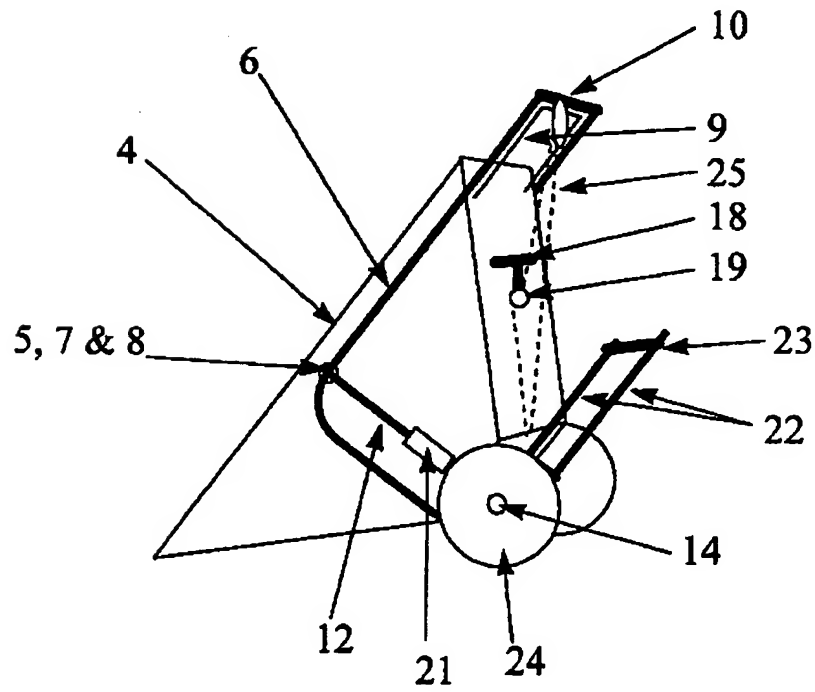


Figure 8



A New Wheel Barrow Design

This invention relates to a new design of wheel barrow.

There are many different kinds of barrow designed to address the different needs of the end user. There are some which lift heavy weights, others that are designed to empty with ease. When using these barrows the user does however, need to use his back and leg muscles to lift and then move such barrows. This inevitably leads to back strain etc.

There are four basic elements to the use of a barrow.

1. filling
2. lifting
3. moving
4. emptying

If we take each task in turn and examine its problems in relation to the conventional single wheeled barrow as in figure 1.

Filling

Requires the user to lift the load into the wheel barrow. The lifting distance is dependent on the height of the barrows bucket 3 from the ground.

Lifting

A load cannot be directly lifted from ground level but has first to be lifted in to the barrow. Once in the barrow the load can be lifted by using the handles 1. This means the full weight of the load is then transferred from the barrows legs 2 to the users back via the handles and the users arms.

Moving

Once the barrow is filled and lifted the user, whilst still carrying the full weight of the barrow, must apply a force to the barrow, again through his legs, back and arms, to propel the barrow forward along the ground.

Emptying

The user has to lift the load even further vertically to empty the barrow. The handles 1 have to be pushed upwards to allow the load to slide out of the bucket under the forces of gravity. This raising of the handles 1 to a near vertical position requires even more effort from the users legs, back and arm muscles.

For these reasons, only small loads can be carried by a conventional barrow.

The new design explained below provides a means of both lifting and transporting heavy loads with the very minimum of effort. The load is lifted and moved utilising the principles of leverage and pulleys in conjunction with the users body weight and gravity.

The invention novelty is in the way that each of the tasks of filling, lifting, moving and emptying is made easier, so allowing the user to apply his own body weight to achieve these tasks without undue stress on the users muscles, especially those of the back.

In the broadest sense the invention consists of a large de-mountable bucket mounted at its point of balance on a frame that embodies wheels, brakes, means for releasing the bucket from the frame, a pulley system enabling the user to rotate the bucket through 180° pivoted at its mounting points and a means of locking the bucket at 0° and 180° of rotation.

This will be demonstrated in the following text using reference to the plans and diagrams in figures 2 - 11 in which:-

Figure 2 shows side view of the barrow

Figure 3 shows the barrow viewed from the front

Figure 4 shows the barrow viewed from the back

Figure 5 shows the barrow viewed from the underneath

Figure 6 shows the barrow viewed from the above

Figure 7 shows a perspective view detailing barrow in the filling position

Figure 8 shows a perspective view detailing barrow in the filling position biased towards the back of the barrow

Figure 9 shows the barrow in operation detailing as follows...

- a. filling or loading/unloading position with the user in the raise/lower position
- b. stationary bucket completely balanced and bucket locked
- c. moving forward
- d. barrow parked legs on ground
- e. starting to rotate and empty bucket
- f. bucket in the vertical position
- g. bucket locked at 180°
- h. start of returning bucket to normal position
- i. bucket passing through the vertical position
- j. bucket returned to balance point ready for locking

Figure 10 A version of the barrow with a detachable bucket

Figure 11 A version of the barrow with a detachable bucket

- a. user filling the bucket with a shovel
- b. user lifting/lowering an object using the bucket as a lifting platform

The invention consists of a bucket 4 probably made of galvanised steel which is pivoted at the balance point 5. At these pivot points 5 the barrow is connected and secured to the tubular frame 6 with very strong bolts 7 and anti-slip nuts 8. This allows the bucket 4 to swing and find its centre of balance.

The frame 6 is almost entirely made of one bent tubular section of steel with two additional square tubular sections between the pivot point 5 and the stub axle 14 on each side and another possibly round bar 23 between the cut ends of the frame 6 which are denoted as legs 22. The handle 10 is part of the frame 6 and is referred to separately for means of explanation. The frame 6 is self supporting being able to stand on its pneumatic wheels 24 and legs 22.

The bucket is held steady within the frame by sprung locking bolts 9 which are situated on either side of the frame 6 adjacent to the handle 10. The sprung locking bolts are connected together via a release bar 26. These locking bolts 9 locate in holes 11 in the bucket 4 and therefore keep the bucket's 4 relationship to the tubular frame 6.

There are a corresponding set of holes 15 in the front of the bucket. These holes 15 lock the bucket 4 into place when the bucket 4 is rotated through 180° on the pivot points 5 when being emptied.

The rotation of the bucket 4 is achieved by a pulley system. The pulley 16 on the front of the bucket 4 is linked to another pulley 17 in the centre of the handle 10 via a strong rope 25 probably made of nylon or other strong flexible material. A further pulley 19 is attached to the emptying handle 18

The rope 25 makes a pulley system. One end of the rope 25 is fixed to an eyelet on pulley 16 and routed under the bucket 4, through the pulley 17, back under the bucket 4, through the pulley 16 and then back under the bucket 4 for a third time before passing through the emptying handle's pulley 19 and then being fixed to an eyelet on pulley 17.

The pulley system is operated via the 'T' shaped emptying handle 18 which is normally stowed on a simple clip 20 on the bucket 4.

The bucket 4 is released from it's locked position by releasing the locking bolts 9 by operation of the release bar 26.

The 'T' shaped emptying handle 18 can be unclipped, held in both hands and pulled over the handle 10. The user by means of body weight alone may lean back against the weight of the bucket and walk backwards away from the barrow therefore pulling on the rope 25.

By pulling on the rope 25 in such a manner the bucket 4 is rotated through 180° and hence can be completely emptied without lifting the load bodily.

To stop the barrow moving whilst the user is pulling on the emptying handle 18 the user will employ the brakes 21 on the wheels 24. These brakes could be simple wedges which run up and down a square tubular section 12 which acts as a strengthening element on the tubular frame 6. The brake wedges 21 can be secured out of the way when the barrow moves.

The tubular frame 6 has straight cut ends which form legs 22 for the barrow when parked, stopping the barrow from toppling forwards or backwards. These legs also act as a secondary braking system when the barrow is emptied using the emptying handle 18, since they will dig into the ground when the user is utilising the pulley system.

The wheels 24 are held on stub axles 14 that are directly welded into the frame 6. These axles are located directly under the pivot points 5 of the bucket 4. The bar 23 linking the legs 22 is stood on by the user whilst holding the handle 10 when operating the bucket to raise or lower loads. Accordingly user imparts his full body weight via the leverage of the legs 22 to the stub axles 14 on the load. In this way the user only uses his body weight and gravity to lift the load.

The four basic tasks in summary

Filling

With reference to figure 10d & 10e for position of the barrow, the user and the load.

With the bucket 4 secured by locking bolts 9 through holes 11. The barrow is tilted forward so that the bucket 4 front panel is resting on the ground. This presents the user with the bucket 4 at the lowest possible level. Load can be manoeuvred in to the bucket 4 with the minimum of lifting effort.

If the user is shovelling a load such as sand into the bucket 4 the he will not need to lift each shovel by straightening his back to raise it over the lip of the bucket as with the conventional barrow in figure 1. The user simply has to throw the load in to the back of the bucket 4, not requiring him to continually arch and straighten his back, the load will find its own level as if he were throwing sand against a wall. The sand forms a sloped pile against the bottom of the bucket. The bucket can be filled to its maximum without righting the barrow to its wheeling position because the load falls in to a sloped pile whose slope matches that of the bucket 4 sides.

Lifting

With reference to Figure 9a & 9b for position of the barrow and the user.

Once loaded the user engages the brakes 21 on both wheels and moves to the back of the barrow, holds the handle 10 and steps on to the bar 23 with one or both feet dependent on the weight being lifted. In the case of heavy weights the user may well be able to stand on the bar 23 without the barrow righting itself. In this case the user will lean back from the handle without physical effort, so imparting more leverage on the load. As the bucket 4 moves to the righted position figure 9b the user steps off the bar 23 and the load becomes null when the weight is borne entirely by the wheels 24 directly under the pivot point 5.

Moving

With reference to figure 9c for position of the barrow and the user.

When the bucket 4 is righted the user moves forward propelling the barrow by leaning against the handle 10 with the abdominal region of the body. Accordingly the user does not impart any lifting forces via arms and back purely using his body weight and leg muscles alone.

Emptying

With reference to figure 9d - 9j for position of the barrow and the user.

The user parks the barrow and employs brakes 21 and releases the bucket 4 by operating the release bar 26. He then unclips the emptying handle 18 pulling it over the handle 10 and walks backwards away from the barrow so pulling the bucket 4 through the vertical (see figure 9f). The user may carry on pulling the bucket to a safe locked position (see figure 9g) where the bucket is upside down. In this secondary locked position the locking bolts 9 are employed in holes 15. The bucket is safely locked so the user may disengage the brakes 21 and move the barrow.

The empty bucket 4 is returned to the normal position by releasing the locking bolts and rope.

Alternative pulley systems

Although the text above describes in detail the pulley system to give the user weight advantage over the load, it may well be possible just to employ a rope with or without the emptying handle 18 running between the handle 10 and the front of the bucket 4. This would be the case in small versions of the barrow where the capacity of the bucket 4 would be around 0.25 of a cubic meter. Larger versions would require the pulley system when 0.33 to 0.4 cubic meter buckets are used. Whatever the cubic capacity the overall construction would not change.

Other design options maybe to activate the brakes 21 automatically when the pulley system is employed by means of incorporating the brakes activators in the pulley system or triggered by

the bucket's 4 rotation, this would ensure the wheels 24 were locked safely when the pulley system is under strain.

An alternative pulley systems could be achieved by using a ratcheted foot pedal pulley on bar 23 which has a rope, cable or webbing attached to the front of the bucket 4 as in the systems described above. This would allow the user to repeatedly operate the foot pedal and take up the rope therefore rotating the bucket 4. This would also have the added advantage that the user would still be able to hold the barrow handle 10 whilst rotating the bucket. A large mechanical advantage could be engineered into the pulley system so the user would use his body weight to achieve the buckets rotation. The ratcheted pedal pulley would have a release mechanism that is foot operated to return the bucket 4 to its normal position. It may not be necessary in this case to have holes 15 to lock the bucket in the empty position as this would be achieved by the pulley and rope in this case.

Detachable bucket

Other versions of this barrow may include the ability to release the bucket 4 from the frame 6 by means of clips at the pivot point 5 so that the frame 6 can be separated. This would allow those who need to move many loads (in an environment such as a factory) to do so without having to purchase complete barrows. They would just purchase one frame 6 complete and as many detachable buckets as they require.

The means of lifting lowering and detaching the bucket is shown in figure 10. Where 10a shows the bucket 4 at rest on the ground ready for the frame 6 to be detached and figures 10b & 10c show the bucket being raised or lowered.

The user releases the bucket 4 by operating the release bar 26 but whilst doing this allows the bucket 4 to drop forward. The locking bolts 9 will come above the lip of the bucket 4 and allow the bucket 4 to rest on its flat bottom. The frame 6 would then be released at the pivot points 5 and be removed. The reverse would allow the bucket 4 to be attached to the frame 6 again.

Claims

1. A new wheel barrow design comprising of a detachable bucket mounted at its point of balance on a frame that embodies wheels, brakes, means for releasing the bucket from the frame, a pulley system enabling the user to rotate the bucket, pivoted at its mounting points and a means of locking the bucket at its normal and empty positions of rotation.
2. A new wheel barrow design as in Claim 1 that can be lowered so the front of the bucket lies on the ground (as in figure 10e) to provide a ground level lifting platform.
3. A new wheel barrow design as in Claim 1 or Claim 2, that can be lowered so the front of the bucket lies on the ground (as in figure 10d), to expose the full bucket aperture to enable the bucket to be filled completely with loose material e.g. sand or straw, so the user does not have to lift the material vertically over the bucket's lip.
4. A new wheel barrow design as in any preceding claim whose bucket rotation is facilitated by means of a rope, chain or other similar mechanism between the bucket and the frame, not necessarily a system of pulleys.
5. A new wheel barrow design as in claim 1, 2 & 3 whose bucket rotation is facilitated by means of a ratcheted foot pedal embodying a mechanical pulley that links the frame to the bucket.
6. A new wheel barrow design as in any preceding claim, where the bucket is not detachable from the frame by means of release clips on the pivot points.
7. A new wheel barrow design as in any preceding claim, where by the braking system is automatically activated by the use of the pulley system or buckets rotation.
8. A new wheel barrow design substantially as described herein with reference to Figures 2 - 10 of the accompanying drawings.

Amendments to the claims have been filed as follows

1. A new wheel barrow design which comprises a two wheeled frame with a de-mountable bucket which is pivoted at points which will bias the bucket and its load to the carrying position, to minimise the chance of spillage and which can be positioned so as to have a side of the bucket flat against the ground so enabling the user to sweep loose material or manoeuvre heavy solid items in to it and to lift the load by means of a levered advantage via the wheel barrows frame utilising the user's body weight and gravity alone also where the bucket is totally emptied by the use of a mechanism offering mechanical advantage which facilitates the rotation of the bucket on its pivot points up to 180° .
2. A new wheel barrow design as in claim 1 where the bucket is not de-mountable.
3. A new wheel barrow design as in any preceding claim whose bucket rotation is facilitated by means of a rope, chain or other similar mechanism between the bucket and the frame, not necessarily a system of pulleys.
4. A new wheel barrow design as in claim 1 or 2 where the mechanism used to facilitate the rotation of the bucket is a pulley system with or without a locking ratchet mechanism.
5. A new wheel barrow design as in claim 1 or 2 whose bucket rotation is facilitated by means of a ratcheted foot pedal embodying a mechanical pulley that links the frame to the bucket.
6. A new wheel barrow design as in claim 1 or 2 which embodies a pulley system which by means of a ratchet or other locking device may securely hold the bucket at any point in its rotation between 0° and 180° .
7. A new wheel barrow design as in Claim 1 or 2 that can be lowered so the front of the bucket lies on the ground (as in figure 10e) to provide a ground level lifting platform.
8. A new wheel barrow design as in Claim 1 or Claim 2, that can be lowered so the front of the bucket lies on the ground (as in figure 10d), to expose the full bucket aperture to enable

the bucket to be filled completely with loose material e.g. sand or straw, so the user does not have to lift the material vertically over the bucket's lip.

9. A new wheel barrow design as in any preceding claim, where by the braking system is automatically activated by the use of the pulley system or buckets rotation.
10. A new wheel barrow design substantially as described herein with reference to figures 2 – 10 of the accompanying drawings



The Patent Office

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Claims searched: 1 to 7

Examiner: Karl Whitfield
Date of search: 16 September 1997

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B7B (BTW)

Int Cl (Ed.6): B62B 1/18, 1/24

Other: Online database: Derwent World Patents Index accessed via Questel

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 5039271 (JULIAN) especially figures 3 and 4	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.